North Carolina Sandhills Conservation Partnership

Quarterly Meeting Minutes

Wednesday, September 10, 2025

**Drowning Creek Visit**

23 partners attended the morning field trip. Special thanks to Brena Jones for taking the lead on sharing during this discussion. Partners visited Drowning Creek on TNC’s McPhaul Tract and had a discussion about species of concern in the watershed and management strategies. Species of concern include fish such as the Pinewoods Darter, Broadtail Madtom, Thinlip Chub (Siouan), Sandhills Chub, and Ironcolor Shiner; several crayfish species; and mussels. Low flow events can affect physical connectivity, increase contaminant levels, alter oxygen levels, and affect streamflow patterns that shape community composition. Any partners working in this steam system could help out by documenting any observations of flow disconnection. Further capacity is also needed to increase research. Management needed in this system includes treating invasive species such as apple snails and hydrilla as well as retrofitting infrastructure to reduce impervious surface, install rainwater filtration systems like rain gardens, and address problematic culverts, bridges, and dams.

**Southern Pines Water Plant Visit**

Partners toured the Southern Pines water plant next. Thanks to David McKew for leading a great tour! The visit included viewing internal testing areas, water purification procedures and the on-site reservoir, and lots of great discussion. The SoPi water plant supplies not only the town itself but areas north towards Carthage. The plant runs 24 hours per day and is currently authorized/rated up to 8 MGD, though infrastructure (i.e., pipes) laid at the time of construction would allow for expansion if needed. The Town has several storage reservoirs, including a 140 MG reservoir that was added after the creek ran dry in 2002 that makes the system much more resilient. In instances of low flow, Southern Pines has an ordinance that can be activated at the discretion of the Town Manager. This ordinance prohibits unnecessary water usage like washing cars and watering lawns and is enforced by town law enforcement. For more information, go take the tour!

**Meeting: 1-4pm**

**Attendance**

*The Nature Conservancy*: Dana Carpenter, Lauren Goodman, Alan Teed, Annie Pas, Lydie Costes, Jeff Marcus, Michelle York, Deb Maurer

*NCDEQ*: Harold Brady, Forest Shepherd, Marica Thomas

*Moore County Public Works*: Brian Patnode

*NC State Parks*: Cason Verhine, Jason Haywood, Jimmy Dodson

*Town of Southern Pines*: James Michel, Reagan Parsons

*LKC*: Adam Kiker

*NC Forest Service*: Casey Wofford

*Quail Forever*: Marie Young, Jake Comer

*NCWRC*: Brena Jones, Kyle Rachels, Langston Rimmer, Alisa Davis, Tim McFayden, Cody Fulk, David Mattocks, Benjy Strope

*Fort Bragg*: Brian Ball, Brian Williams, Robert White, Rod Fleming, Jessie Schillaci, Gregory Brooks, Alan Schultz, Darin Burns

*The Ember Alliance*: Elizabeth Smith, Matthew R. Buice, Killian Farrell

*SPBA*: Jesse Wimberley

*Ruffed Grouse Society/American Woodcock Society*: Sara Cerv

*NCFSWC*: Tom Potter, Kevin Johnson

*USFS*: Susan Miller

*SEI*: Kerry Brust, Jeff Walters

*JCA Inc*: Jan Goodson

*TRLT*: Jessie Wilson, Emily Callicutt, Barry Hull

*USFWS*: Jennifer Archambault, Caroline Causey, Nicole Sikula

*NCNHP*: Judy Ratcliffe, Mike Schafale

*The Longleaf Alliance*: Ryan Bollinger

*UNC Pembroke*: Jerry Griffith

*Eastern NC Sentinel Landscapes*: Chris Baillie

Total attendees: **59**

Number of partners represented: **23**

**NCSCP Project Updates**

Jeff Marcus presented updates on partnership initiatives, with the help of several colleagues.

Jake Comer presented on Quail Forever receiving NFWF funding of $500k in 2025 to support Sandhills PBA and technical assistance. TNC received an additional $500k from an anonymous donor added to the 2024 award to extend the shared burn crew, extend fire crew lead positions, and extend subawards to TRLT, the Plant Conservation Program, the NC Botanical Garden, and others. TNC plans to apply for NFWF again in the 2026 cycle and partners are encouraged to reach out to Jeff to discuss submitting a project for a sub-award.

Susan Miller presented on Joint Chiefs Uwharries to Sandhills Phase 2 being funded for another 3 years at $3.3 million. That pot will fund the Ember Alliance shared burn crew, dedicated EQIP cost share, a Conservation Corps Crew to support private landowner burning, and fire training with the Catawba nation.

Alisa presented on the Harnett County comprehensive plan update, which was completed in April. Green Growth Toolbox has been pushed throughout and the plan includes lots of environmental priorities including conservation corridors and buffer recommendations along streams, a military corridor overlay that sets priorities to limit development, and developer incentives to increase open space and conservation.

Jeff presented on the Moore County land use plan, which includes recommendations for conservation and military interests, including water use and land use planning.

Hoke County is also starting their land use plan update.

The Town of Southern Pines also passed an update to their land use plan and is working on implementation including updated ordinances to protect trees.

Annie Pas presented updates to wetland restoration efforts on the Sandhills Game Lands. The NC Conservation Corps worked for three weeks in 2025 with support from the Ember Alliance and TNC enhancing six wetlands. This work will continue in 2026.

**Streamflow Project**

Lydie Costes, Brian Patnode, Harold Brady, Dana Carpenter, and Jeff Marcus presented on the streamflow project, which focuses on Drowning Creek above the US 1 gage and the entirety of Lower Little River. The following presentation explores potential contributing factors to these issues. For full details, please see the [recording](https://www.youtube.com/watch?v=Li3CAV-F-Wo) and slide deck from the presentation.

In 2017, these two streams were analyzed by the NCSCP. As part of that analysis, Drowning Creek was found to have had a decline in flows since 1940. Meanwhile, the Lower Little River was home to several extreme flood events especially around Hurricanes Florence and Matthew that impacted operations on Fort Bragg as well as local communities.

**Drowning Creek**

Drowning Creek is a blackwater stream home to rare fish species as well as crayfish and mussels. The town of Southern Pines draws water from the creek, and Moore County is considering increasing water capacity by pulling from the creek. Both minimum and overall flow trends have declined since 1940.

Brian Patnode presented the county’s plans. Moore County is projected to have a 6 MGD shortage by 2052. The county is considering two options for water intake: Deep River and Drowning Creek. Both options have pros and cons and a final decision has not been made. The county’s Land Use Plan that is in progress could impact which option is best.

Dana Carpenter presented what we know about monitoring wells in the Drowning Creek basin. There are just three monitoring wells that we found data for, all surficial with varying depths and lengths of time of data collection. The three wells do not show consistent trends.

Lydie Costes introduced the concept of baseflow and showed that the baseflow index has declined over time. The baseflow index represents the percentage of overall flow that is baseflow (i.e., not stormwater runoff). The lower the baseflow index, the less resilient a system is to low flow events. Baseflow is impacted by numerous factors, including soils and geology, impervious surface, weather patterns, and withdrawals.

Precipitation in Drowning Creek is actually trending upwards, but variance is also trending upwards, which suggests longer periods of drought along with more extreme precipitation events.

Harold Brady presented on reported withdrawals. Withdrawals must be reported to the NCDEQ if they exceed 1 MGD for agriculture and 100,000 G/D for all other uses. Average reported withdrawals appear to be approximately 5.43 MGD based on current reported data, though there are several sources that have not reported recently and we do not know if/how much they may be currently withdrawing. Maximum daily reported withdrawals were 17.38 MGD. Sources include the Southern Pines Reservoir, several golf courses, some mining and agriculture.

Lydie Costes pulled flow data broken by a breakpoint in the mid-1980’s identified by Julie DeMeester, which coincides with the construction of Lake Auman and the Southern Pines water intake. The median 3-day minimum flow has declined by 30 CFS (19.4 MGD) between the two time periods, while the median 3-day summer flow has declined by 52 CFS (33.6 MGD). Maximum reported withdrawals as identified by Harold correspond to roughly half of the decline in median summer flow. Reporting withdrawals wasn’t formalized until the early 2000’s, so unfortunately we’ve got some knowledge gaps in terms of understanding the history of withdrawals.. and this is only reported withdrawals! We have no idea how much is being taken and not reported.

Freeman & Marcinek (2006) found that species richness declined when average reported withdrawals exceeded half of a 7Q10-equivalent of water. Our maximum estimates of reported withdrawals are double that threshold, which is 6.9 CFS. Harold Brady’s current estimate of reported withdrawals is 8.4 CFS, which is 20% above the threshold.

Moore County population has increased from around 20,000 around the early 1900’s to around 100,000 at the last census, and projected to reach 170,000 by 2050.

County agricultural data suggests that Moore and Montgomery counties have had an increase in irrigated land from the 1950’s to present, and Montgomery and Richmond counties have had an increase in broiler chickens sold from the 1980’s to present. However, these data are not geospatial and the Drowning Creek basin makes up about 10% of these three counties by area, so we cannot determine conclusively whether unreported agricultural withdrawals are exacerbating flow issues.

Intern Yuntian Bi conducted an analysis in the summer of 2024 using LANDSAT and high-resolution aerial imagery to calculate changes in land cover over time. The results agree with our anecdotal expectations that forest and urban land cover types have increased while agriculture has overall decreased, but due to substantial inconsistencies in the classification from year to year, we are hesitant to draw conclusions from these data. An increase in development and impervious surface could contribute to low flows because more water will be lost in runoff rather than infiltration and contribution to groundwater recharge.

Jeff Marcus presented on forest management impacts to flow. Forests can lose water via evaporation off leaves and transpiration (evapotranspiration), and open canopy forests tend to have lower evapotranspiration compared with closed canopy forests. Forest Inventory Analysis data shows increasing basal area (but not tree density) of pines since the 1970’s. Various studies have found that thinning, burning, and converting to longleaf can increase flow. Although a specific study is needed in the NC Sandhills to accurately calculate the volume of impact, such studies suggest that thinning and burning could positively contribute to streamflow in Drowning Creek.

Dana Carpenter consulted the literature for privet and found that privet has high levels of transpiration. Invasives control and replacing species like privet with native species like cane could benefit flows, though the volume of this impact is unknown.

Lydie Costes presented impacts of impoundments on low flows. Impoundments can be used to mediate low flows by releasing pulses. However, withdrawals and evaporation from reservoirs remove water from the system, and dams interfere with seasonal patterns, hold sediment, and disrupt natural regimes downstream, resulting in damage to riparian systems, which could impact infiltration and runoff. SARP data shows two dams that have been marked at least possibly feasible for removal, though many others have not been evaluated.

**Lower Little River**

Lower Little River (LLR) has experienced an increase in flood events, particularly moderate and major flooding. The latter events are almost all associated with hurricanes Matthew and Florence. LLR has had an increase in flow variance, suggesting more extreme flow at both ends of the scale.

Pope Army Airfield is located close to LLR and runs over a portion of Tank Creek. The airfield was flooded during both hurricanes Matthew and Florence, and because it may be needed to deploy troops anywhere in the world on short notice, such flooding events present a serious issue for national security.

Precipitation in the LLR basin has increased over time, but so has variance, so we would expect both more extreme precipitation events and longer periods of drought. Unfortunately these conclusions rely on only about 25 years of available data.

As with Drowning Creek, Yuntian’s overall landcover change analysis suggests an increase in forest and urban space and decrease in agriculture. Increased impervious surface can exacerbate runoff in storm events, contributing to sudden dramatic flooding issues rather than allowing water to infiltrate and slowly recharge the streams.

Dams can reduce flooding by physically holding back water, but the disruption to downstream ecological processes can mean that floodplains and wetlands are disconnected and not as successful at catching and holding floodwaters. Also, dam breaches can be a serious safety concern, and the volume of water held back by a dam becomes an extra liability in the case of a breach, particularly given that they tend to coincide with the most extreme flow events.

Consultants with McCormick Taylor modeled the removal of three dams on the Lower Little River using one-dimensional HEC RAS models: Nicks Creek Dam, Crystal Lake Dam, and Old Mill Dam. Crystal Lake Dam was predicted to have a decrease of 6.43 ft in water surface elevation upstream of the dam in the event of removal, while the other dams did not show upstream effects and none of the dams showed downstream effects. Because this type of modeling cannot fully account for sediment trapping, long-term floodplain adjustment, and other factors, these results are inconclusive, but suggest that dam removal may not be a significant solution to flooding in the Lower Little River.

Consultants also modeled backwater effects from the Cape Fear River. With an increase in 20 feet of water surface elevation above the 100-year storm event, the Cape Fear would contribute backwater upstream to an estimated distance of 43,785 ft, which is close to Hwy 217 near the town of Linden. Pope Army Airfield is located approximately 3x this distance from the confluence, so backwater from the Cape Fear is not expected to impact flooding at the Airfield.

**Streamflow Summary**

In conclusion, streamflow are complex, and many of our questions remain unanswered or only partially answered. With many unknowns in mind, we nonetheless believe that withdrawals and increasing droughts are contributing to the low flows of Drowning Creek, and that increasing severity of precipitation events and impervious surface are contributing to the flooding in Lower Little River.

**Solutions**

Many potential solutions were mentioned, including land use planning to manage growth and restrict floodplain development, incentives for conserving water and reducing impervious surface, inspecting pipes, thinning and burning, enhancing stormwater management requirements, upgrading culverts, restoring wetlands and streams, and more. See slides for more.

**Discussion**

* Jesse Wimberley mentioned that there has been a huge increase in sedimentation in both Drowning Creek and Lumber River. The full reasons are unknown, though some of this may be due to development. Also, low flows may not have enough velocity to transport normal levels of sediment through the system. Sediment clogging up a creek will not change the amount of water but may result in water displacement. Excess sediment can also have negative impacts on ecological communities.
* Mike Schafale pointed out that the lower stretches of Lower Little River have unusually entrenched channels that are the result of natural geological phenomena. This means that there isn’t much floodplain and the water will naturally have large fluctuations. Areas close to the stream will flood during major events despite the vertical distance to the streambed, so development should be avoided close to the river.
* Mike Schafale pointed out that the permeability of sandy soils may mean higher infiltration rates and therefore even bigger impacts from impervious surface than in areas with less permeable soils. He suggested that the high infiltration of sandy soils could mean that less water is being lost via transpiration in forested settings, which might mean that the impacts of forest management are lower with sandy soils than other soil types. This is conjecture, but the conclusion is that impervious surface should be a target for interventions.
* Partners inquired whether Lower Little River and Drowning Creek have been examined side by side, to see if the trends of declining baseflow in Drowning Creek are matched by other rivers in the region. If the trends are similar, that could point to climate being a more significant factor, whereas Drowning Creek’s situation being more extreme could suggest that local factors like withdrawals are significant. See the DC-LLR Comparison slides on the NCSCP website for a comparison of these data.
  + Partners pointed out that the floodplain structure of Drowning Creek means it is far less likely to flood than Lower Little River, as wide floodplains provide a buffer.
  + Lower Little River also has more human concerns with flooding. The depth of the creek bed due to geological factors means that areas at risk of flooding are less obvious and more likely to be developed.
  + See DC-LLR Comparison slides for data on flood days in Drowning Creek.
  + Partners agreed that evaluating culverts and other infrastructure will be important in the Lower Little River to assess vulnerability.
* Jeff Marcus pointed out that NCSCP are not the decision makers with regards to policy and land use but can inform those partners. With gaps in data and understanding, how do we make decisions in the face of uncertainty?
* Alisa Davis mentioned that WRC can do educational presentations to commissioners and other parties interested in learning about these findings.
* Partners mentioned RLUAC as a good forum for presenting the study results. Also, agricultural partners should be brought into the conversation.
* Mike Schafale brought up that although nature-based solutions are valuable, sharing out the results of this study needs to place an emphasis on withdrawals and impervious surface and the decision makers who can impact those factors, as nature-based solutions cannot single-handedly solve these issues.
  + Jeff Marcus pointed out that the NCSCP is already working on many of these nature-based management strategies that provide many benefits, and we can embrace the prospect that the work we are doing could benefit streamflow.
* Partners discussed water efficiency strategies and options like replacing lawns with native landscaping can reduce everyday water use.
  + Southern Pines representatives mentioned that the town relies on water consumption profits to sustain production. Dramatically reducing everyday water usage is not in the financial interests of the town to retain infrastructure.
  + Increasing water rates is very unpopular, which makes the margin of sales more important.
  + Partners pointed out that in drought-stricken parts of the country where major water reduction efforts have gone into effect year-round, the margin to reduce usage during drought periods is reduced.
* Catching and fixing pipe leakages is one low-hanging water-saving strategy that should certainly be implemented.
* Not all commentary are captured in this summary; see the recording for more details.

**Partner Updates**

* Jeff Walters provided an update on the state of RCWs in the Sandhills. SEI has been collecting the longest-running territorial bird study since 1984, on private lands, Fort Bragg, and portions of the Game Lands. SEI lost their funding from Fort Bragg this year and as a result did not collect any data on Fort Bragg or Camp Mackall this year. They were able to stretch funds to continue monitoring on the Game Lands and private lands. They lost two staff members this year (Andy and Anna) due to the lack of certainty about future finances and therefore Kerry was doing all monitoring with some help from J. Carter & Associates. In the future, under current financial circumstances SEI will only be able to continue monitoring on private lands. Funding is needed and a monitoring plan for the Sandhills to continue collecting information on the Sandhills RCW population as a whole.
  + Kerry added that her GIS capabilities are limited for the moment.
  + Jeff Marcus commented that this is an opportunity to redefine what is needed
* Jeff Walters also shared that the Georgetown-based group Road To Recovery has included Bachman’s Sparrow on their High Urgency List, so there will probably be extra attention on that species in the upcoming years.
* Jennifer Archambault shared that the new FWS Director Brian Nesvik was approved in August. Southern Hognose Snake has been recommended to be listed as threatened and the comment period is currently open. Nation-wide there has been a spending freeze since late July for Ecological Services (the freeze was lifted on September 16th). The Raleigh ES office is down 60% with early retirements since last year, which is really affecting capacity. They have gotten some extra help from other offices including Nicole Sikula as Acting Deputy.
* Alan Schultz shared that Bragg leadership is looking at obstructions on the base and how those affect flood response. Manchester Road is currently closed. It’s hunting season – don’t forget to wear blaze orange in the woods and carry a light at dusk/dawn.
* Jeff Marcus shared that the Southeast Regional Partnership for Planning And Sustainability (SERPPAS) is holding their meeting in Southern Pines on November 17-18. There will be a field tour.
* Susan Miller shared that USFS have reached the milestone of being “on the path” of restoring/establishing/having one million acres on USFS properties. They want to celebrate in conjunction with the SERPPAS meeting and may have a celebration sometime Nov 17-20th. No details yet, but partners will be welcome and encouraged to attend so stay tuned.
* Lydie Costes shared that the next NCSCP meeting will be held virtually on December 3rd . This is our biennial NC Longleaf Summit so will include the other LITs in NC. Let Lydie know soon if you have ideas for topics that would be relevant across the state.
* Jake Comer shared that sign-up for EQIP and CSP is due November 7th. Any landowners who want funding should get their applications into NRCS by then.